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ABSTRACT

This resource booklet is a companion to the second volume of the North Central Regional Educational Laboratory's (NCREL) "Urban Audio Journal" entitled "Computers and Education." The resource booklet includes selected listings of: (1) 24 articles, books and audiotapes about technology and education; (2) 8 online resources, including AskERIC, for educators and students to explore; (3) 9 organizations that focus on education and technology; and (4) technology initiatives in schools and districts throughout the NCREL's seven-state region and the nation. A glossary of key terms is included. (SLD)

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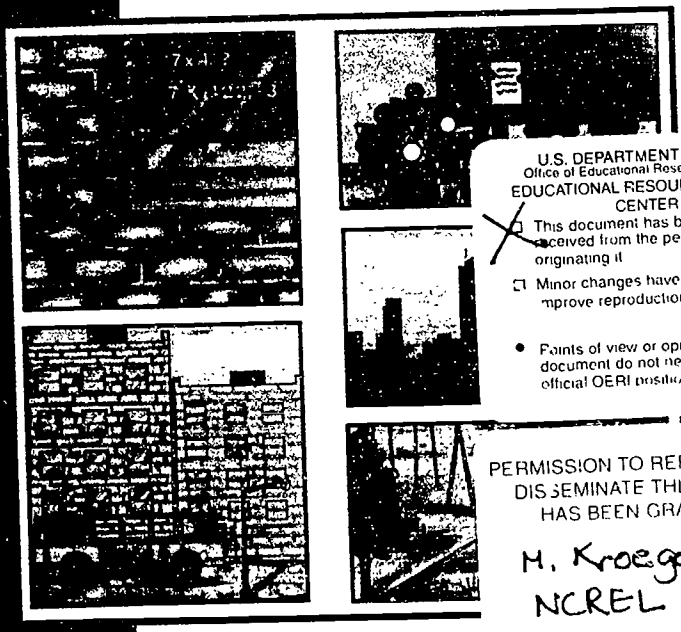
Integrating Technology & Education: A Resource Booklet

Companion to the *Urban Audio Journal*



What's Inside

- Resource Materials
- Online Resources
- Organizations
- Technology Initiatives
- Key Terms

This Resource Booklet was produced by the North Central Regional Educational Laboratory (NCREL) to accompany *Computers and Education*, an audiotape produced by National Public Radio®. NCREL is distributing the tape and booklet as the second volume of the *Urban Audio Journal*.

Vol. 1
No. 2

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NCREL is one of ten federally supported educational laboratories in the country. NCREL develops educational products and services for school administrators, policymakers, teachers, and parents in its seven-state region encompassing Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin.

The Urban Education Program's mission is to improve the education of urban children and youth, especially those who are underachieving and historically underserved. We develop products and services that connect superintendents, principals, and teachers from nearl · 5,000 urban schools to research and best practice, and we work with schools and districts to build capacity for (1) teaching advanced skills to all students, (2) implementing multicultural education, (3) leading school change and innovation, (4) supporting professional development that promotes whole school change, and (5) building partnerships between schools and communities.

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Integrating Technology & Education:
A Resource Booklet

Introduction

This Resource Booklet is a companion to the second volume of NCREL's Urban Audio Journal, entitled *Computers and Education*. (The audiotape was produced by National Public Radio® and disseminated by NCREL as part of its Urban Schools Development Outreach Program). This Resource Booklet includes selected listings of:

- Articles, books, and audiotapes about technology and education
- Online resources for educators and students to explore
- Organizations that focus on education and technology
- Technology initiatives in schools and districts throughout the nation

With the growing use and availability of technology and the push for educational reform, policymakers, educators, and practitioners are seeking ways to integrate technology and education to improve learning.

NCREL is disseminating the second Audio Journal and accompanying Resource Booklet to help practitioners, policymakers, and others as they develop and implement technology initiatives.

Technology can greatly enhance the quality of children's learning by expanding their learning community beyond traditional boundaries. Technology also provides educators and students with access to a wide range of resources. Many researchers (McKenzie, 1993; Jones, Nowakowski, Valdez, & Rasmussen, 1994; Means, 1994) argue that technology can be used as a tool to challenge and engage students, while enhancing problem-solving and critical thinking skills. With the use of technology, however, comes a number of questions: How will it be used? For what purpose? Who will have access? How will technology be funded? Will technology support the status quo or lead to significant changes in educational policies and practices?

Inside you will find a selected listing of materials, resource organizations, and technology initiatives. Not intended to be exhaustive, the listing will assist you as you develop strategies for integrating technology into your educational program. We look forward to your feedback on the enclosed evaluation card.

Featured Sites (Contact Information)

This section includes information for contacting the sites featured in ***Computers and Education***.

Contact information for Claudio Sanchez features:

Sheila Cory
Director of Instructional Technology & Media
Chapel Hill-Carrboro City Schools
(919) 967-8211

Ephesus Road Elementary School
1495 Ephesus Church Road
Chapel Hill, NC 27514
Contact: Sheila Cory

Contact information for John McChesney features:

Al Morasch or Jim Dunnigan
Shoreline Public Schools
18560 First Avenue NE
Shoreline, WA 98155
(206) 361-4225

Apple Classrooms of Tomorrow (also see description in **Other Technology Initiatives** section)

Internet address: **http//www.atg.apple.com/acot/index.html**

Resource Materials

This section features various articles, books, videos, and magazines, produced by NCREL and others. These resources can increase your knowledge about education and technology and guide you as you navigate the information superhighway.

Administrators at risk: Tools and technologies for securing your future

by Jamie McKenzie, 1993

This easy-to-read book examines the connection between technology and school restructuring. Recognizing that the technology age is upon us, McKenzie insists that educators must develop new skills in order to work and live in our technology-driven society. The author also places a strong emphasis on attitudinal and behavioral changes, which he asserts are critical for us to realize the full potential of technology.

Administrators at risk covers some of the following topics: the challenges of implementing change, the intersection of technology and restructuring efforts, creating an environment for integrating technology, and evaluating new technologies. It also takes a critical look at technology applications such as Computer-Assisted Instruction (CAI) and Integrated Learning Systems (ILS). Available from: ***National Educational Service, 1610 West Third Street, P.O. Box 8, Bloomington, IN 47402, (812) 336-7701.***

Assessing the role of technology in education

Edited by Dan Wishnietsky, 1994, for the Center for Evaluation, Development, and Research (CEDR) Hot Topics Series

This compilation of research articles explores the role of technology in education. Some of the topics examined in this volume include:

- Technology and school reform
- Leadership for technology
- Staff development
- Evaluation of technology programs
- Applying the Internet
- Technology and teacher education
- Emerging technologies
- Technology and assessment
- Computer literacy
- Ethical issues
- Technology and special education
- Technology and at-risk students

Available from: ***Phi Delta Kappa, P.O. Box 789, Bloomington, IN 47402-0789, (800) 766-1156.***

Byting back: Policies to support the use of technology in education

by Ray Ramirez & Rosemary Bell, 1994

This document examines how telecommunications and information technologies are being applied to support school restructuring efforts and how these technologies are being funded. The authors argue that efforts to integrate technologies should be primarily driven by curriculum goals and should result in coordinated planning between various levels of government. Technology initiatives should result in an infrastructure for integrating technology and education, equitable access to technologies, and staff development opportunities that support curriculum integration.

Ramirez and Bell examine how technology can best be adapted to support a challenging curriculum, how these information technologies affect the way teachers teach and students learn, how this electronic connectivity will be funded, and related policy issues.

Recommendations for policymakers at the federal, state, and district/local level are provided. Partnerships with the private sector and the creation of regional information networks are two vehicles presented for providing greater technology access. Available from: ***North Central Regional Educational Laboratory, Accounts Receivable, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735.***

Designing learning and technology for education reform

by Beau Fly Jones, Gilbert Valdez, Jeri Nowakowski, & Claudette Rasmussen, 1994

With technology to support engaged learning as the goal, the authors present a framework to help school leaders and policymakers evaluate specific technologies and technology-enhanced curricula. The framework emerged as the result of an earlier literature review of research on technology effectiveness conducted for the Illinois State Board of Education (Jones, Valdez, & Rasmussen, 1994) in which researchers reviewed various technologies: computers, distance education, two-way interactive telecommunications, multimedia, and the Internet. The researchers focus on *how* technology is used. The authors argue that technology must be a tool to meet learning goals that support engaged student learning.

The paper is divided into six parts. Part 1 presents an overview of the framework and its potential uses. Part 2 discusses the new consensus on learning, policy, and the technology capabilities needed to support learning and reform. In part 3, the researchers consider trends that focus on the use of networked information resources and the development of learning communities. Part 4 examines regionality as a strategy for designing and implementing an effective technology/learning interface. Part 5 outlines some critical next steps for research. The last section of the paper

outlines recommendations for policymakers. Available from: ***North Central Regional Educational Laboratory, Accounts Receivable, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735.***

Educator's Internet companion

by Wentworth Worldwide Media, Inc., 1995

This guide presents 30 reproducible K-12 lesson plans for subject areas ranging from creative writing to global warming to history. A World Wide Web chapter orients teachers to 50 Internet sites. An overview of K-12 resources on the Internet, tutorials for new users, a glossary, and listing of funding sources comprise this comprehensive guide. Available from: ***Association for Supervision and Curriculum Development (ASCD) Customer Service Center, 1250 N. Pitt St., Alexandria, VA 22314-1453, (703) 549-9110.***

Educational Leadership: How technology is transforming teaching

October 1995 edition (vol. 53, no. 2) of Educational Leadership

This issue of *Educational Leadership* focuses on technology. Articles highlight different uses of technology, discuss issues such as funding and professional development, and provide resources for educators.

* This Resource Booklet includes descriptions of key articles from this edition of *Educational Leadership.*

Available from: ***Association for Supervision and Curriculum Development (ASCD), 1250 North Pitt Street, Alexandria, VA 22314-9718, (703) 549-9110, FAX: (703) 549-3891, E-mail: member@ascd.org, Home page: http://www.ascd.org.***

How to find money for technology

February, 1993 edition (vol. 12, no. 5) of Electronic Learning: The magazine for technology and school change

Grant seeking, fund-raising, leveraging limited funds, and maximizing resources through partnerships are a few of the topics addressed in this special edition of *Electronic Learning*. The publication also highlights software and additional publications to help schools and school districts garner funds for technology.

Electronic Learning magazine is published monthly September through April, and bimonthly November/December and May/June by Scholastic Incorporated. Available from: ***ELECTRONIC LEARNING, P.O. Box 53797, Boulder, CO 80322-3797, (303) 604-1464.***

How to fund technology projects

by Denise K. Schnitzer, 1995; Educational Leadership, 53(2), 71-72.

This article outlines the steps for writing proposals for the competitive grants market. The author discusses the research involved in developing a cohesive grant proposal, provides guidelines for grant writing, and lists potential funders for technology projects. Available from: ***Association for Supervision and Curriculum Development (ASCD), 1250 North Pitt Street, Alexandria, VA 22314-9718, (703) 549-9110, FAX: (703) 549-3891, E-mail: member@ascd.org, Home page: http://www.ascd.org.***

Internet for dummies

by John R. Levine & Carol Baroudi, 1994

This user-friendly publication initiates readers to the ins and outs of navigating the Internet. This comprehensive guide explores basics such as: What is the Internet? How does the Internet work? and Getting Started. Chapters also provide information about electronic mail (e-mail), mailing lists, finding resources, Internet providers, Internet software, troubleshooting, and shortcuts for better Internet use. Shaded areas throughout the book highlight major points and provide tips for readers. Available from: ***IDG Books Worldwide, 155 Bovet Road, San Mateo, CA 94402-9833, (800) 762-2974.***

The Internet handbook for school users

by Nancy Protheroe, & Elizabeth Wilson, with Lorene Kluge, 1995

In this handbook, readers will find answers to the questions most often asked by current and potential school Internet users. The guide explores a range of issues, including school support for Internet use, implementation and technical options, security and ethics issues, and the benefits of using Internet in an educational setting. Another section features resources and services available through the Internet and tools for accessing online information. There is also a section that focuses specifically on resources to use in the school and classroom. The final sections of the handbook include a listing of additional readings and key terms, a quick reference sheet of Internet commands, and blank forms that readers can use to create a personal resource list. Available from: ***Educational Research Service, 2000 Clarendon Boulevard, Arlington, VA 22201, (703) 243-2100.***

The Internet yellow pages

by Harley Hahn & Rick Stout

This directory features a comprehensive listing of Internet resources on a diverse range of topics. Arranged alphabetically by topic, this volume lists resources on topics ranging from art to argriculture to education. Readers can also find an index of usenet newsgroups. Available from: ***Osbourne McGraw-Hill, 2600 Tenth Street, Berkeley, CA 94710, (510) 549-6600.***

Laptop schools: Lead the way in professional development

by Gary Stager, 1995; Educational Leadership, 53(2), 78-81.

Gary Stager highlights some innovative professional development approaches that Australian educators are using to build knowledge and skills in technology. The author then provides a list of recommendations for successful technology implementation. Available from: ***Association for Supervision and Curriculum Development (ASCD), 1250 North Pitt Street, Alexandria, VA 22314-9718, (703) 549-9110, FAX: (703) 549-3891, E-mail: member@ascd.org, Home page: http://www.ascd.org.***

Learning with technology: Merging onto the information highway (videotape)

Produced by the North Central Regional Educational Laboratory (NCREL), 1994

This hour-long videotape takes viewers to six sites where technology has been effectively integrated into the learning process: Madison Middle School 2000 in Madison, Wisconsin; North Knox High School in Bicknell, Indiana; Indianapolis Zoo in Indianapolis, Indiana; Kelly High School in Chicago, Illinois; Model High School in Bloomfield Hills, Michigan; and Steele Elementary School in Harrisburg, Pennsylvania. Through these story segments viewers can see how technology affects the nature of teaching and learning.

Learning with technology: Merging onto the information highway explores key issues affecting the integration of technology and education, including: access, funding, staff development, and equity.

An accompanying guidebook describes the sites featured in the tape and provides additional information about funding technology efforts, constructing successful staff development programs, and getting connected to the Internet. The guide also lists additional resource materials and includes a glossary of terms. Available from: ***North Central Regional Educational Laboratory, Accounts Receivable, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735.***

Learning with technology: Tools for thinking (satellite broadcast)

North Central Regional Educational Laboratory

This new program features the new and exciting "tools for thinking" being developed and tested with students and teachers across the country. Targeted to all educators, technology coordinators, parents, and students, this hour-long broadcast discusses university/school partnerships, cutting-edge uses of technology in the classroom, and stories of innovative projects already being implemented in school classrooms. Featured sites include:

- Evanston (IL) Township High School, where a freshman class is participating in CoVis (Learning Through Collaborative Visualization). The segment features students performing scientific investigations using tools that resemble those used by atmospheric scientists (see the Technology Programs and Initiatives section for a more in-depth description of CoVis).

- Community High School in Ann Arbor (MI) where sophomores are using technology to model complex ecosystems such as local streams and creeks. Feedback mechanisms allow students to manipulate the environment and observe and record the results, using graphs, diagrams, spreadsheets, 3-D visualization, and other tools in the database. Students are working with the HiC project at the University of Michigan.

- Hillside Elementary School (MN) where sixth-grade students are using the Internet to conduct research and write research papers by connecting Hypertext links to original sources. An online virtual relationship with the Franklin Institute of Science Museum in Philadelphia enables sudents to conduct wind experiments under the guidance of scientists and researchers there. Using a Web server, students create original work they can share with the world via Internet.

- Foothill Middle School in Walnut Creek (CA) where eighth-grade students are participating in a project called Computers as Learning Partners. Students conduct experiments and collect, measure, and analyze data in real time using computers. As a result, they are able to make connections quickly and apply scientific principles to real-life situations.

Learning with technology: Tools for thinking will air via satellite by PBS K-12 Learning Services on **March 14, 1996** from **11 a.m. to 12 p.m. EST (10 to 11 a.m. CST).**

Broadcast of *Learning with technology: Tools for thinking* is free to schools and institutions within NCREL's seven-state region (Indiana, Illinois, Iowa, Michigan, Minnesota, Ohio, and Wisconsin). A Ku-band or C-band satellite dish is necessary to receive the transmission. Licenses for the program are $100 outside NCREL's region. Taping is included in a licensing agreement available from NCREL.

A guidebook accompanies the program. The guide provides additional information about featured schools and projects and suggestions for staff development activities. It also describes other products available through NCREL to facilitate technology planning and refers to other related resources.

NCREL will provide one master copy of a guide to each licensed institution, which will have the right to duplicate the guide. Additionally, an interactive guidebook is available on NCREL's Web Server (http://www.ncrel.org/ncrel/guidebks/tft.htm). An expanded version of the printed document, this guidebook includes in-depth interviews, links to Web pages of featured schools, and other useful information. For more information, contact: ***License Coordinator, North Central Regional Educational Laboratory, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735.***

NetTeach News

Edited by Kathy Rutkowski

Available in both electronic and paper formats, this newsletter provides resources for K-12 educators. It features information about resources, applications, and events on the Internet and offers tours of cyberspace, topical articles, and graphic illustrations. Ten issues of NetTeach News are released each year. Available from: ***Kathy Rutkowski, (703) 471-0593; or E-Mail: netteach@chaos.com.***

On technology and schools: A conversation with Chris Dede

by John O'Neil, 1995; Educational Leadership, 53(2), 6-12.

This article features an interview with Chris Dede, professor of information technology and education at George Mason University in Fairfax, Virginia. The interview addresses critical issues related to technology and education. Dede discusses the transformative impact of technology on schools, the effect of technology on teaching practices, the information superhighway, access issues, and virtual environments. Dede, while highlighting the extraordinary potential for technology to change schools, cautions us to be thoughtful in our use of technology in education. Available from: ***Association for Supervision and Curriculum Development (ASCD), 1250 North Pitt Street, Alexandria, VA 22314-9718, (703) 549-9110, FAX: (703) 549-3891, E-mail: member@ascd.org, Home page: http://www.ascd.org.***

Plugging in: Choosing and using educational technology

by Beau Jones, Gilbert Valdez, Jeri Nowakowski, & Claudette Rasmussen, 1994

Plugging in is a tool to assist education decision makers as they choose new technologies to support student learning. The booklet integrates research on effective learning and research on effective uses of technology, based on the premise that the two must coincide. A table in the document outlines effective learning indicators based on various dimensions of learning, including vision of learning, tasks, assessment, instructional model, learning context, grouping, teacher roles, and student roles. Another table outlines indicators of high technology performance based on access, operability, organization, engagability, ease of use, and functionality. Using blank charts in the book, educators can assess their school's learning and technology effectiveness and set goals.

Authors explore key policy issues in using technology for learning: equity, standards, finance, coordination, committment, and the role of parents. The researchers also explore the new educational service providers, information and services, capabilities and organization, and comprehensive human/technology infrastructures needed to support technology in schools. *Plugging in* concludes with recommendations for effectively using technology for learning. Available from: ***North Central Regional Educational Laboratory, Accounts Receivable, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735.***

Selling a school technology budget

by Ralph S. Musco, 1995; Educational Leadership, 53(2), 68-70.

This article provides specific strategies for garnering support for technology initiatives. The author suggests that educators make presentations using technology to convince school board members and other key administrators and district personnel of the value of technology in the school or district. Available from: ***Association for Supervision and Curriculum Development (ASCD), 1250 North Pitt Street, Alexandria, VA 22314-9718, (703) 549-9110, FAX: (703) 549-3891, E-mail: member@ascd.org, Home page: http://www.ascd.org.***

Systemwide approaches to learning and technology: Pioneering initiatives in four urban districts

by Felicia Bohanon, 1994

This *Policy Brief* examines the use of technology in four urban school districts in Orange County, Florida; St. Paul, Minnesota; Dallas, Texas; and Denver, Colorado, each of which has a state-level technology plan. This brief explores the *types* of technology applications being used in the schools and the *ways* in which they are being used.

Bohanon also explores the various staff development efforts underway in the four districts. Efforts include technology training courses (some for graduate credit), computer loans to teachers for training and classroom use, and training of school teachers to serve as technology resource people.

In addition to the need for staff development, each district recognized the importance of evaluating school technology efforts. The author examines the assessment tools being used in the four districts studied. At the time of the study, both Dallas and Orange County had developed methods for assessing the impact of their technology programs on teaching and learning, and St. Paul and Denver were in the process of developing assessment methods for their districts.

A matrix provides an overview of the types, uses, scope, funding, unique features, and evaluation tools of each urban district featured. The paper also includes contact information for each district. Available from: ***North Central Regional Educational Laboratory, Accounts Receivable, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735.***

Teachers & technology: Making the connection

by Congressional Office of Technology Assessment (OTA)

In 1993 Congress requested that the Office of Technology Assessment conduct a study to answer several questions: Do teachers use technology in their teaching? If so, why? What happens when they do? Why don't more teachers use technology? How do teachers learn about technology? Are prospective teachers being prepared to use technology in the classroom? What factors influence implementation of technology in schools and districts? What roles do schools, districts, states, and the federal government play in helping teachers adjust to the challenges and opportunities presented by new technologies?

The study found that many teachers are not using technology and many of them feel that they have not been adequately trained to do so. Divided into several sections, this user-friendly report summarizes study findings and looks at the current state of technology in teaching, and explores the promise of technology for teachers, the technologies that are currently available and accessible to educators, the factors that influence technology use, teacher education and technology, and the federal role in technology and teacher development. Available from: ***U.S. Government Printing Office, New Orders, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA, 15250-7954, (202) 512-1800.***

Technology and education reform: The reality behind the promise

Edited by Barbara Means, 1994

Following an introductory chapter exploring the uses and implications of technology in education, authors engage in an in-depth discussion of strategies for using technology to teach at-risk students. They also examine the use of computer networks. A wide range of other topics are explored, including integrating technology with teacher preparation, using technology to support innovative assessment, evaluating the effects of technology in school reform, and policy issues. The final chapter of the book features exemplary uses of technology in the school and classroom. Available from: ***Jossey-Bass Publishers, 350 Sansome Street, San Francisco, CA 94104, (415) 433-1767.***

Technology education in the classroom: Understanding the designed world

by Senta Raizen, Peter Sellwood, Ronald Todd, & Margaret Vickers, 1995

This guide for using technology to teach science presents vignettes showing how educators across the country are using technology in the classroom. Additionally, the authors explore ways to lay the foundation for technology, create coherent programs, and structure curriculum differently. Available from: ***Jossey-Bass Publishers, 350 Sansome Street, San Francisco, CA, 94104-1310, (415) 433-1767, FAX: (415) 433-0499.***

Toward a technology infrastructure for education: Policy perspectives I (Policy Briefs, Report 3, 1994)

Regional Policy Information Center, NCREL, 1994

This paper opens with an introduction by Dennis Gooler of Northern Illinois University, who writes about education as an important component of the National Information Infrastructure. Gooler outlines the policy implications of creating an infrastructure for technology, including programming, training, funding, coordination and planning, technical, and evaluation issues. The *Policy Brief* goes on to describe technology efforts underway throughout NCREL's seven-state region (Illinois, Indiana, Iowa, Ohio, Michigan, Minnesota, Wisconsin) and provides contact information for each entry.

A summary of key legislation affecting educational technology rounds out this document. Available from: ***North Central Regional Educational Laboratory, Accounts Receivable, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735.***

Using technology to support education reform

by Barbara Means, John Blando, Kerry Olson, Teresa Middleton, Catherine Cobb Morocco, Arlene Remz, & Judith Zorfass, 1993

The intersection of technology and education reform is the topic of this report. The authors describe technology applications and the use of technology for tutorial learning, exploratory learning, and communications. The authors examine the availability of these various technologies.

The authors also examine the effects of technology use on student achievement. Additionally, the paper outlines the support for teacher functions that technology provides and the challenges that teachers confront when using technology.

The report concludes by exploring why reforms fail, what lessons can be learned from implementation studies, the role of business, and models for expanding education reform. Available from: ***U.S. Government Printing Office, Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328, ISBN 0-16-042048-2.***

Online Resources

Below are a few online resources to try out in your school or classroom.

AskERIC

This site features educational resource materials and over 1,000 lesson plans for a wide range of curriculum areas. AskERIC is a free, e-mail question and answer service for educators, students, and parents. Visitors to this site can also scroll through the AskERIC InfoGuides for a list of more then 200 indexes of information on subjects ranging from chemistry to African history to distance education. Address: ***gopher://ericir.syr.edu***; E-mail: ***askeric@ericir.syr.edu.***

Daily Report Card

This site features the latest education news for K-12 educators, parents, and students. Address: ***http://www.utopia.com/mailings/reportcard.***

ENC Online

Eisenhower National Clearinghouse for Mathematics and Science Education

The Eisenhower National Clearinghouse (ENC) provides resources to help educators improve teaching and learning in mathematics and science. ENC is funded through a contract with the U.S. Department of Education, Office of Educational Research and Improvement. The Resource Finder at ENC's online site provides instructional materials for K-12 mathematics and science, as well as links to other Internet sites for math and science education. Address: ***http://www.enc.org.***

NASA Spacelink

This site houses an interactive database featuring science activities, lesson plans, and NASA flight information. Address: ***http://spacelink.msfc.nasa.gov/html/xt.index.html.***

Pathways to School Improvement server

The *Pathways* server contains a continuously updated research database on hot topics in education for educators and school improvement teams. Through the Internet's World Wide Web, the *Pathways* server puts the latest research right on your desk. You can also "visit" schools through audio and video clips as well as through the Illustrative Case descriptors.

The *Pathways* server presents information through five areas: environment, students, content areas, educators, and teaching, which contain topics such as leadership, at-risk students, science, technology, and professional development. For each topic "critical issues" have been identified such as "Providing Hands-on, Minds-on, and Authentic Learning Experience in Science." Each critical issue has a common format that provides research summaries and practical advice:

- Issue
- Different Points of View
- Action Options
- Overview
- Illustrative Cases
- References
- Goals
- Contacts
- Implementation Pitfalls

Address: **http://www.ncrel.org/ncrel/sdrs/pathways.htm** For more information, contact: ***North Central Regional Educational Laboratory, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735, FAX: (708) 571-4716; E-mail: info@ncrel.org.***

Scholastic Network

The Scholastic Internet Center is an extension of the publishing company and provides resources for K-12 teachers and students, including resources for integrating the Internet into the curriculum, hands-on projects, and an online multimedia magazine written by and for middle and high school students. Address: ***http://www.scholastic.com.***

Urban Education Web (UEweb)

In 1995, the ERIC Clearinghouse on Urban Education launched UEweb as an Internet resource for urban students, their families, and the educators who serve them. UEweb is accessible via the World Wide Web and offers full-text books and manuals, reviews of educational publications, digests, articles, parent guides, short bibliographies, directories, conference announcements, and links to other urban education sites. It contains abstracts of urban education publications in the ERIC databases—the largest educational databases in the world.

Sections explore a number of topics, including:

- Urban and Minority Families
- Compensatory Education
- School Reform
- Administration and Finance
- School Safety
- Urban and Minority Student Services
- Technology in Urban Education
- Urban and Minority Youth Development

- Equity and Cultural Diversity
- Community Involvement
- Urban Teachers
- Curriculum and Instruction
- Higher Education, Postsecondary, and Adult Education

The first and largest section, Urban/Minority Families, is a component of the National Parent Information Network (NPIN), hosted by the ERIC Clearinghouse on Urban Education and the ERIC Clearinghouse on Elementary and Early Childhood Education at the University of Illinois. NPIN's direct connection is: ***http://ericps.ed.uiuc.edu/npin/npinhome.html*** UEWeb's address: ***http://eric-web.tc.columbia.edu.*** For more information, contact: ***ERIC Clearinghouse on Urban Education, Institute for Urban and Minority Education, Teachers College Box 40, Columbia University, New York, NY 10027, (800) 601-4868, FAX: (212) 678-4012, E-mail: eric-cue@columbia.edu.***

Weather Underground

This database features weather-related information for the United States and Canada, including the current time and temperatures. The database is maintained by the University of Michigan Department of Atmospheric, Oceanic, and Space Sciences. Visitors to the site can track weather trends across the country, calculate the longitude of various cities based on the time of day, or use temperature information to compare Farenheit and Celsius. Address: ***gopher://groundhog.sprl.umich.edu.***

Technology Resource Organizations

Below is a listing of organizations that provide resource materials and technical assistance to those interested in integrating teaching, learning, and technology. Each entry includes contact information.

Association for Educational Communications and Technology (AECT)

Washington, DC

With a membership of over 4,500 professionals, the Association for Educational Communications and Technology (AECT) joins a wide range of people interested in the use and application of education technology. AECT is organized into 11 special-interest divisions. The organization, begun in 1923 as a department of the National Education Association (NEA), has been independent since 1974.

As an international service provider and advocate for the integration of technology into education, AECT conducts an annual international convention with more than 300 educational sessions, sponsors a trade show featuring instructional technology products, holds a Leadership Conference each summer, publishes a membership newsletter and annual membership directory, produces *TechTrends* and *Educational Technology Research and Development*, and offers various award and scholarship programs. For more information, contact: ***AECT, 1025 Vermont Avenue, NW, Suite 820, Washington, DC 20005-3547, (202) 347-7834, FAX: (202) 347-7839.***

Center for Children and Technology (CCT) Education Development Center, Inc.

New York, NY

Founded at Bank Street College in 1981, the CCT changed its institutional affiliation in 1993, and became a division of the Education Development Center, Inc. (EDC is a national nonprofit organization committed to quality education for all learners). The mission of the center is to investigate the roles technology does and can play in children's lives, particularly in the classroom. The center also explores the design and development of prototypical software that supports engaged, active learning.

The Education Development Center, Inc., has been promoting human development through education since its founding in 1958 and was, therefore, a perfect match for the CCT. As an international research and development organization, EDC's mission is to improve educational quality, effectiveness, and equity throughout the world. EDC brings together a staff of over 300 educators, researchers, and curriculum/software developers who work with schools, school districts, policymakers, and other

researchers and developers to address the critical issues of educational reform facing our nation. CCT is one of many administrative divisions or centers that comprise EDT. For its current annual revenues of $33 million, this publicly supported, nonprofit organization leverages funds from grants or cost reimbursement contracts. For more information, contact: ***Nancy Ross, CCT, 96 Morton Street, 7th Floor, New York, NY 10014, (212) 807-4207, FAX: (212) 633-8804, E-mail: nross@confer.edc.org.***

Educational Technology Publications

Englewood, NJ

Educational Technology Publications has been a major publisher in the field of educational technology with over 300 books covering the topic. Founded in 1961, the organization's magazine, *Educational Technology*, boasts readership in more than 100 countries.

In January 1996, Educational Technology Publications will release *The Educational Technology Handbook: A Comprehensive Guide—Process and Products for Learning* by Steven Hackbarth. The book includes resources, 800 numbers, and information about instructional design, interactive environments, and using the Internet. For more information, contact: ***Educational Technology Publications, 700 Palisade Avenue, Englewood Cliffs, NJ 07632, (800) 952-BOOK.***

ERIC Clearinghouse on Information and Technology

Syracuse, NY

This organization provides resources related to educational technology and library and information science. Areas of focus include instructional design, development, and evaluation with an emphasis on educational technology and educational communication media—computers and microcomputers, telecommunications (cable, broadcast, satellite), audio and video recordings, film, and other audiovisual materials—as they pertain to teaching and learning. Within library and information science, the organization focuses on the operation and management of information services for education-related organizations. For more information, contact: ***Marilyn Smith, Syracuse University, 4-194 Center for Science and Technology, Syracuse, NY, 13244-4100, (315) 443-3640, (800) 464-9107, FA (315) 443-5448, E-mail: eric@ir.syr.edu.***

I*EARN (International Education and Resource Network)

Yorktown Heights, NY

I*EARN is a nonprofit organization which provides students with opportunities for international collaboration and technical learning via telecommunications. The purpose of the I*EARN Network is to enable elementary and secondary students to make a meaningful contribution to the health and welfare of people and the planet. I*EARN helps students go beyond simply being "penpals" to use telecommunications in joint educational projects. The I*EARN network rides on an international backbone of 16 partner telecommunications networks that form its management team, all of which are accessible through the Internet. Students and teachers can connect with people around the world through their I*EARN accounts via E-mail, telex, video/speaker telephone, or fax. They can also contact people on commercial networks, such as America Online, Compuserve, Prodigy, and others.

I*EARN has an international membership of 400 schools in 21 countries, with local nodes in 96 countries. They sponsor joint learning projects and products that build the next generation's "global village" and help young people understand and act on the ways they can help improve our shared world.

Many disciplines and interdisciplinary topics can be accessed through I*EARN: science, social sciences, language arts, math and the humanities. Examples of joint student projects include: newsmagazines and newspapers; ozone and water pollution measurement; DNA research; support for children in Bosnia and Somalia; studies of acid rain, cultural heroes, democracy, the Holocaust and other educational/social issues; portraits of 21st century schools; development of a guide for U.S./Russian joint ventures; and creation of a deforestation treaty.

I*EARN also sponsors travel and exchange programs between I*EARN participants, and provides newsletters, training videos and manuals for participants. Fee rates vary; some cost-capping for schools may be available. For more information, contact: ***I*EARN, International Secretariat, 345 Kear Street, Yorktown Heights, NY 10598, (914) 962-5864, FAX: (914) 962-6472, E-mail: iearn@igc.apc.org, Home Page on the Internet: http://www.learn.org/iearn.***

Illinois Computing Educators (ICE)

Addison, IL

Illinois Computing Educators (ICE) started in 1986, when a group of approximately 30 educators met to discuss the possibility of forming a statewide organization for computer-using educators. Membership now exceeds 1,000. The purpose of ICE is to:

- Promote the development and use of computers and technology in all facets of the educational process
- Provide professional development opportunities for its members and other interested parties through the use of computers and technology
- Distribute information about computing and technology throughout the state
- Build a support network among members

The organization connects educators to professional development opportunities and each other via electronic bulletin board, chapter meetings, workshops, committees, and an annual state conference (ICE Breaker). In addition, ICE produces a semi-monthly newsletter, maintains a public domain software library, conducts a teacher recognition and mini-grant program, and trains teachers for an annual Kids' Technology Conference. For more information, contact: ***Illinois Computing Educators (ICE), 222 N. Kennedy Drive, Addison, IL 60101, (708) 628-1088, FAX: (708) 256-4818.***

Institute for the Transfer of Technology to Education (ITTE)

Alexandria, VA

The National School Boards Association (NSBA) is a nationwide advocacy organization for public school governance founded in 1940. NSBA is a not-for-profit federation of state associations of school boards and the school boards of the District of Columbia, Guam, Hawaii, Puerto Rico, and the U.S. Virgin Islands. It represents 95,000 school board members.

The ITTE was launched in 1985 by NSBA and its federation of state school boards associations to encourage thoughtful and informed decisions about the use of technology in public education. ITTE provides special services to school board associations; sponsors conferences; and publishes a newsletter, the *Electronic School*, and other materials related to technology and education.

A major component of ITTE is *The Technology Leadership Network.* The network engages school districts across the nation in dialogue about technology in education via meetings, a newsletter, various projects, and special reports. For more information, contact: ***National School Boards Association, 1680 Duke Street, Alexandria, VA 22314, (703) 838-6722, FAX: (703) 683-7590.***

International Technology Education Association (ITEA)

Reston, VA

The International Technology Education Association (ITEA) is a worldwide network of teachers created in 1939 by a group of educators. ITEA's mission is to advance everyone's technology capabilities. As an advocate for increasing technological literacy, ITEA provides teaching and learning systems and promotes research for developing and advancing technological literacy. The organization strives to:

- Provide a philosophical foundation for the study of technology that emphasizes technological literacy
- Provide teaching and learning systems for developing technological literacy
- Foster research to advance technological literacy
- Serve as a catalyst in establishing technology education as the primary discipline for the advancement of technological literacy
- Increase the number and quality of people teaching technology

ITEA publishes *The Technology Teacher* and *The Journal of Technology Education* (JTE) and a number of other resource publications, curriculum materials, and videos. ITEA also operates *The Technology Bank*, which includes article reprints concerning projects and activities; curricula; speeches; information on organization and management; and the *Technology Research Bank*, a collection of abstracts from graduate-level technology research. Its annual conference every spring attracts more than 2,000 educators and 200 exhibits. The *Technology Festival* at the conference offers participants an opportunity to share and/or demonstrate ideas, activities, or materials used to teach technology.

In addition to its numerous activities, ITEA offers a number of councils to meet the needs of college students, college/university-level educators, technology education coordinators, and elementary-level teachers. The organization's telecommunications network—IRIS—connects educators using telecommunications to enhance classroom projects and support professional development. For more information, contact: ***ITEA, 1914 Association Drive, Reston, VA 22091-1502, (703) 860-2100, FAX: (703) 860-0353.***

TERC

TERC is an education research and development organization committed to improving mathematics and science learning and teaching. Founded in 1965, the private, nonprofit organization specializes in creating innovative curriculum, fostering teacher development, conducting research on teaching and learning, and developing technology tools. The organization is organized into four project-based centers: Mathematics, Research, Science, and Tools for Learning. Each center has a specific focus, yet each one's work relates to and informs the work of the others. TERC is involved in numerous projects throughout the country dealing with curriculum for both students and teachers. The organization, for instance, is working with the University of Chicago School Mathematics Project (UCSMP) to implement a four-year teacher development project that will result in print and video materials for use by staff developers to prepare teachers to implement innovative mathematics curricula, and two regional implementation centers—one in Las Vegas and the other in Detroit—that will conduct the staff development program for local teachers. Collaborators include Everyday Learning Corporation and Dale Seymour Publications, publishers of UCSMP and TERC curricula, respectively. The project is funded by the National Science Foundation.

TERC is also assisting Cambridge Public Schools in Massachusetts in planning and implementing a kindergarten to grade nine systemic science staff development program. During the four-year program TERC will conduct workshops and provide inservice teacher support. The initiative is funded by the Cambridge Public Schools.

TERC is also working on a project with middle school classes in Boston to develop curriculum units to support students as they explore their urban environment through the use of GIS (Geographic Information Systems) and other mapping techniques. Students might, for example, explore water resources, the infrastructure of utilities and transportation ("pipes and wires"), and immigration patterns. The project is funded by the National Science Foundation.

TERC also operates a number of telecommunications curricula including the Global Lab network. They developed the Kids Network, a project now published by the National Geographic Society that connects over a quarter-million students annually. For more information, contact: ***TERC, 2067 Massachusetts Avenue, Cambridge, MA 02140, (617) 547-0430, FAX: (617) 349-3535.***

Technology Programs and Initiatives

The following descriptions highlight school, classroom, and districtwide technology initiatives throughout the country. Each entry includes contact information. This section is divided into two parts: regional initiatives and initiatives in various parts of the country.

Regional Roundup

This section highlights some of the technology happenings throughout NCREL's seven-state region: Illinois, Indiana, Iowa, Michigan, Ohio, Minnesota, Wisconsin.

Illinois

Grant Descriptions

The Center for Learning Technologies awarded $4.5 million in competitive grants to schools across Illinois to help promote technology as a tool for improving teaching and learning and the academic performance of students in grades K-12.

Through the grants, the state is helping local educators explore the endless possibilities of using technology to further improve schooling in Illinois by integrating technology and information resources into the teaching and learning environment. The grants are divided into two categories:

- Technology Implementation in School grants: support schools that use technologies to improve the quality of instruction and student learning and to increase students' opportunity to learn.
- Installation of Network grants: support electronic networking among schools by putting an infrastructure into place to create local computer networks and to access Internet.

There are 14 demonstration sites receiving Technology Implementation grants that will serve as models for other schools to demonstrate how the application of technology affects teaching and learning, student assessment, professional development, and other aspects of the school learning environment.

Demonstration Sites

The 14 demonstration sites are located throughout Illinois in rural, urban, and suburban schools. Sites include:

- Community Consolidated School District 59
- Township High School District 214

- Bloomington School District 87
- Scott-Morgan C.U. School District 2
- School District 299-DuSable High School
- Christopher Community High School District 38
- Marshall C.U. District 2
- Naperville C.U. School District 203
- Waukegan C.U. School District 60
- Woodstock C.U. School District 200
- Harlem Unit District 122
- Palatine C.C. School District 15
- Pekin Public School District 108
- Springfield School District 186

Waukegan School District 60

The Waukegan School District 60 is a recipient of a Challenge Grant for Technology awarded by the U.S. Department of Education to 19 communities in 16 states across the country. Over 500 communities applied for the grants, which may be available through a second-round competition during the 1995-96 school year. The site has been working in partnership with NCREL, Apple Computers, and the Waukegan Schools Foundation to provide a classroom model that fosters engaged learning through high performance technology. Clusters of computers and teacher demonstration stations provide online access to a wide variety of multimedia resources. Instruction is characterized by teacher-designed, problem-based, interdisciplinary projects linked to schoolwide themes. Students work in collaborative teams to investigate questions they have posed that relate to science or social science issues. They create multimedia presentations using the PBL model for learning. Science and math students, for instance, are involved with Northwestern's CoVis project and share data with students and teachers from 35 other schools across the nation as they explore issues of land management, weather, and science.

The district has also created a staff development program that "immerses" teachers in a resource-rich learning environment and places them on work teams to produce multi-media presentations to enhance problem-based learning. Teacher leaders have

also worked on collaborative teams to write problem-based learning resource units and use strategies provided by the district's peer coaching program to reflect on effective practice together.

The district will continue its activities and expand its efforts through the Challenge Grant for Technology in Education. The district plans to expand its efforts to include 16 business, professional, community, and industry partners. The project will focus on improving math and science proficiencies and workplace readiness skills. Technology Learning Community Centers (TLCC's) will provide extended opportunities for the community and its partners to achieve its lifelong learning-technology goals.

For more information on Waukegan School District 60 contact: ***Elaine Armani, Waukegan Community Unit School District 60, 1201 North Sheridan Road, Waukegan, IL 60085, (708) 360-5440.*** For information the Challenge Grants, contact: ***Interagency Learning Technology Office, U. S. Department of Education, Suite 6300, 1250 Maryland Avenue, SW, Washington, DC 20202, (202) 708-6001; Internet: http://www.edu.gov.***

Products under development

In addition to the grants, the Illinois State Board of Education is working with the 14 demonstration sites, the Illinois Math and Science Academy, and the North Central Regional Educational Laboratory to develop tools to assist districts in planning technology for teaching and learning. A Planning Resource guide is being developed that will be available on the Internet and will link to other Internet resources. The Planning Resource guide will provide organized research-based information about effective technology use in schools. Schools will be able to view documents and research from various locations in the country to use as they develop their own technology plans. A print version of the Planning Resource guide will be available to schools that are not yet connected to the Internet. The guide will assist educators as they plan, build a knowledge base, establish goals and general direction, determine implementation priorities and strategies, evaluate efforts, and reflect upon their practice. The guide, available in early 1996, will include tips on planning, building a knowledge base, setting goals, evaluating efforts, and revising for improvement.

A Technology Profiling Process will also be presented in a printed document (see the *Resource Materials* section for a more detailed description that includes descriptive scenarios of teachers and students using technology for teaching and learning). The Learning Through Technology Profile will enable schools to determine their current status in using technology and to outline goals—what they want to look like and be like in the future, and to develop strategies for achieving greater levels of engaged learning through the use of technology. The Technology Profile will be linked to the Planning Resource guide so that schools can identify and develop strategies to increase student achievement using technology resources. The book is currently

being field tested and will be available in early 1996. A CD-ROM version of the Technology Profile will also be available that includes video examples and automatic scoring. For more information contact: ***Carole Fine, Director, Professional Development, North Central Regional Educational Laboratory, 1900 Spring Road, Suite 300, Oak Brook, IL 60521, (800) 356-2735.***

Indiana

Technology Associates Program

This Indiana Department of Education effort provides technology-related staff development for public and private K-12 schools in Indiana.

The Program maintains a cadre of educators throughout the state who are available to present technology-related workshops. Each workshop is developed by a Technology Associate to respond to the needs of the requesting school or corporation. Workshops last two hours in length to a full day, depending on the topic, and are held on school days, after school, or Saturdays.

The Technology Associates Program, with assistance from the Indiana Computer Educators (ICE), also provides training sessions on IDEAnet, the statewide telecommunications system.

Public and nonpublic schools or corporations can request a specific workshop or IDEAnet training session by submitting a Technology Inservice Request Form to the Center for School Improvement and Performance. Requests must be made at least four weeks prior to the proposed workshop.

Summer workshops are also available through the Technology Associates Program. A brochure listing approximately 50 technology-related workshops around the state is sent to superintendents in April. K-12 educators may attend any workshop listed in the brochure for a nominal fee. ***Request forms are available from building principals or by calling Carolyn White, Program Coordinator, (800) 527-4930 or (317) 232-9182.***

Indiana Principals' Technology Leadership Training

Since 1990, Indiana's Principals Technology Leadership has provided technology training for school administrators. Over 700 principals have participated in the training, with an additional 100 participating in the 1995-96 school year. Superintendents nominate principals each June to participate during the following year. Training is held in small groups and uses the latest computer equipment and software (IBM and Apple MacIntosh). Throughout the program, principals are assisted in identifying resources available to support their successful use of technology.

Training follows this format:

- **Days 1 and 2 (Sept./Oct.):** Technology in the Front Office—activities focus on word processing and desktop publishing, online communications, database and speadsheet applications, desktop presentations, and organizational skills for greater personal productivity.

- **Day 3:** Held during school visits, focuses on discussion of technology issues, including developing effective technology plans.

- **Day 4 and 5 (April):** Offers greater exploration of technology in schools and culminates in a celebration of participants' accomplishments in the program. Each participant's school receives a $500 grant to buy computer hardware and software.

During the months between training days, each principal completes a Goal Action Plan—a technology project designed to assist with some aspect of school management. Cooperative learning strategies are used throughout all training and support activities. For more information, contact: ***Carolyn White, Program Coordinator, Indiana Department of Education, (800) 527-4930 or (317) 232-9182. Jim Ellsberry of the Indiana Principal Leadership Academy provides program assistance.***

Indiana Buddy System Project

The Buddy System Project is a seven-year-old Indiana program that uses personal computer technology and telecommunications to extend learning beyond the school day into the home. At its core is the belief that strong family involvement in education increases student success in school and throughout life.

The idea for the Buddy System Project emerged from Dr. H. Dean Evans, then-Indiana Superintendent of Public Instruction, and several private-sector individuals. To address such information-age issues as education, changing work force skills, the family's impact on learning, and Indiana's competitiveness in the world economy, the group created the Buddy System Project.

The long-term vision of the Buddy System Project is to place a computer in the home of every Indiana child in grades 4 through 12. The realization of this vision will give every child, regardless of socioeconomic background, the opportunity to reach his or her potential for a productive and fulfilling life.

The project focuses on creating family/school partnerships with common objectives for education. Teachers, students, and parents work together to create new avenues for learning that improve productivity and expand the world of information resources. The Buddy System equips participating elementary schools with technology and loans personal computer equipment to students' families for one year.

During the 1995-96 school year, the Buddy Project is serving more than 6,000 fourth-, fifth-, and sixth-grade students and their families at 50 sites. All incoming Project parents receive an instructional booklet entitled *At Home With Learning*, introducing them to the Buddy concept. Buddy Leadership Camps, designed for teams of students, parents, and teachers, are conducted during the summer to develop and nurture technology-related skills, which are then shared with their respective schools. For the second year, each Buddy family has the opportunity to purchase computer equipment at reduced prices and to finance their purchase with a low-interest loan.

The Buddy System Project is funded by the state of Indiana, Lilly Endowment, Inc., the Ameritech Foundation, participating schools, and local donations. Funding for project participants is allocated on a biennial basis. For more information, contact: ***The Buddy System Project, Corporation for Educational Technology, 17 West Market Street, Suite 960, Indianapolis, Indiana 46204, (317) 464-2074, FAX: (317) 464-2080***

Other initiatives in Indiana:

- Indiana Technology Learning Center
  The Indiana Department of Education, the Corporation for Educational Technology, and Butler University joined forces to create the Indiana Technology Learning Center. The center, housed at Butler University in Indianapolis, opened in October 1995. Apple and Microsoft donated some equipment and software for the center.

- Indiana Clearinghouse for Educational Technology (ICET)
  The Indiana Clearinghouse for Educational Technology is a state-supported technology resource center that provides an array of services to help educators use technology more effectively. Funded by the Indiana Department since 1983, the organization operates on a grant administered by the Indiana University School of Education at IUPUI. **All services are provided free of charge to Indiana educators.**

  Services include a preview center with over 2000 software titles for use with Apple IIe, IIGS, MacIntosh, IBM, and other DOS-based computers. The center also houses videodiscs, CD-ROMS, videotapes, multimedia applications, telecommunications services, resource materials (guides, reference books), and publications on technology and learning.

The center also responds to information requests and publishes the PRINTOUT, a newsletter available free of charge to Indiana educators. For more information, contact: ***ICET, IUPUI, 620 Union Drive, UN 123, Indianapolis, IN 46202, (800) 222-4223 or (317) 274-8001, FAX: (317) 274-8002; through IDEAnet; Internet: ICET@indyvax.iupui.edu.***

Iowa

Iowa Communications Network (ICN)

The Iowa Communications Network (ICN) is a statewide fiber optic network that brings the latest distance learning technologies to Iowans via video, voice, and data transfer. Primarily used for educational purposes, the ICN enables participants at geographically diverse locations to learn together using audio-visual uplinks; participants can also transfer data, graphics, and written documents using computer technology.

The ICN facilitates the sharing of Iowa's educational resources among large and small communities and school districts. Programs are as varied and innovative as the users. For example, Rock Rapids farmers requested and received livestock nutrition classes from a state university. Students in Wapello connect four days a week with the local community college in Keokuk to study differential calculus. High school students at six sites have used the ICN to explore health occupations. And in Sidney, the school district superintendent is now able to participate regularly in superintendent meetings without spending the travel time and money needed to drive to other locations.

There are currently 103 ICN classrooms located at school district offices, community colleges, private colleges and universities, and at area education agencies. There is at least one ICN site in each of Iowa's 99 counties, as well as connections at the state's three regent institutions and at Iowa Public Television in Johnston. Every site has equal ability to create or receive programming.

This project is coordinated largely by Iowa Public Television (IPT). Eligible users of the ICN are defined by the Iowa General Assembly, which recently authorized additional users, including libraries, the Iowa National Guard, state and federal agencies, state and federal courts, hospital and physician clinics, and the U.S. postal service for demonstration projects.

Scheduling of events on the ICN is based on local needs and done upon local request. While many ICN reservations are semester-long classes, a good number are one-time events in the form of guest speakers, electronic field trips, collaborative lessons, staff development, or meetings. Network use has grown from 16,000 hours in the fall of 1993 to 43,000 hours scheduled so far for the fall of 1995. All ICN events are managed by Iowa Public Television.

Plans are in place to expand to an additional 474 end-points within the decade, connecting all private, public, and parochial school districts in Iowa, the remaining area education agencies, and selected libraries. For more information, contact: ***Iowa Communications Network (ICN), c/o Iowa Public Television, P.O. Box 6450, Johnston, IA 50131, (515) 242-4173, FAX: (515) 242-3155, Internet:*** **http://www.iptv.org/iowa_database/**

Michigan

MichNet—Michigan's Computer Network

This statewide computer network, operated by Merit Network, Inc., provides access from computers and local area networks in Michigan to the Internet. Merit offers direct, dial-in, and external network connections as well as online and support services.

People throughout Michigan use MichNet in a variety of ways:

- MichNet provides access to the online library catalogs at Michigan's research universities
- M-Link connects the University of Michigan Library with public libraries statewide. It provides information on economic and community development through listserves and via their internationally known electronic library, GoMLink
- High schools students throughout the United States use MichNet to participate in computer simulations of political and historical events
- State government departments use MichNet to provide access to computer bulletin boards

Michigan K-12 teachers and administrators can access MichNet through Education Central (EdCen). Educational Central is an online communication and resource center for Michigan's professional educators, hosted by Central Michigan University. For more information, contact: ***Merit Network, Inc., 4251 Plymouth Road, Suite C, Ann Arbor, Michigan, 48105.***

Minnesota

In 1993 legislators appropriated $4.8 million to create the Minnesota Education Telecommunications Council (METC). The council's charge was to provide leadership in developing a statewide vision, plans, and coordination for the use of distance learning technologies. The legislation supported the creation of six higher education telecommunications regions.

Legislation in 1995 provides for the development of a statewide school district telecommunications network and continued support for the Learning Network of Minnesota. The legislation establishes a grant program to connect each school district and regional public library system to the existing state telecommunications network (MNet), the backbone for the Learning Network of Minnesota. The Learning Network will connect all public postsecondary education campuses by the end of 1995.

Network connections for school districts and public libraries are to be coordinated and fully integrated into existing state telecommunications interactive networks to achieve interconnectivity of school districts and libraries to higher education institutions, state agencies, and other governmental units, agencies, and institutions throughout Minnesota. The legislature appropriated $5.5 million in fiscal year 1996 and $5 million in 1997 for grants to school districts and regional public library systems as part of a $22.5 million K-12 technology initiative.

The Office of Information Technologies of the Minnesota Department of Children, Families, and Learning is offering Instructional Transformation Through Technology grants. The grants will be awarded to partnerships of teachers and administrators from ten or more schools within at least three school districts. Funding of up to $2.7 million will be available in 1995-96, with consideration for further or additional funding in the second year. Schools will receive the grants to develop models for implementing information technologies that support learning in the classroom and enhance teaching and learning productivity.

For more information on the Minnesota Telecommunications Council, contact: ***Ann Grindland, Minnesota Higher Education Services Office, 400 Capitol Square Building, 550 Cedar Street, St. Paul, MN 55101, (612) 296-9681, FAX: (612) 297-8880.***

For more information on the Instructional Transformation Through Technology grants, contact: ***Mary Mehsikomer, Project Specialist, Office of Information Technologies, Minnesota Department of Children, Families, and Learning, 550 Cedar Street, St. Paul, MN 55101, (612) 296-2752.***

Advantage: Internet II

SCI/MATH^{MN} is working with the Minnesota Council of Teachers of Mathematics, Minnesota Science Teachers Association, and TIES to provide teachers of mathematics and science with standards-based training on the Internet. With support from *Advantage: Internet*, teachers are reaching beyond their classroom walls and connecting electronically with their colleagues and math and science leaders around the country. *Advantage: Internet* is also developing and supporting an online "infobase" of classroom-ready resources for math and science teachers. A total of 45 teachers selected on a regional basis are now prepared to serve as Internet trainers and mentors. They are now training and leading 400 elementary and secondary teachers across the state. Look for the arrival of SCI/MATH^{MN}'s online resource service on the InforMNS gopher service during the 1995-96 school year.

From Access to Application: Bringing the Internet into the Science and Mathematics Classroom

SCI/MATH^{MN} was awarded a $700,000, three-year grant from the U.S. Department of Education's National Eisenhower Program for *From Access to Application: Bringing the Internet into the Science and Mathematics Classroom*. The project will work with eight elementary schools, grades four to six, over three years to develop a model professional development program that promotes elementary teachers' competence and self-confidence in using the facilities and resources of the Internet in science and mathematics classrooms. Participating teachers will use action-based research to create a model professional development program rooted in the National Mathematics and Science Education Standards. They will be supported by a talented team of partners, and be electronically linked to the National Education Supercomputer Program (NESP) at Lawrence Livermore National Laboratory in California. After learning the Internet-accessible NESP tools and resources, they will design applications for the classroom. Dissemination will begin in the third year, with the Internet as the distribution vehicle.

For more information about *Advantage* or *From Access to Application*, contact: ***Co-Project Director Mike Damyanovich at (612) 282-5453 or Co-Project Director Margo Berg at (612) 724-2705.***

Ohio

SchoolNet

The goal of this statewide initiative is to wire every classroom in every public school in the state to allow for voice-, video-, and data-transmission, including interactive distance learning. Additional infrastructure will provide linkages outside the classroom walls. Ultimately, the program seeks to stimulate thinking, learning, and doing—using technology to expand the traditional classroom experience for our children and help them acquire skills that will be critical to education and job markets of the future. Governor Voinovich has targeted $50 million to wire Ohio's 100,000 classrooms. Funding will be provided to a school district after its technology plan has been approved by the Department of Education and its wiring meets or exceeds SchoolNet standards. Another $45 million will provide a DOS or Apple Computer workstation and related technology for every classroom in the 25 percent of Ohio districts that are low-income. The Ohio Department of Administrative Services will identify equipment suppliers and handle procurement procedures.

Up to ten SchoolNet prototypes will receive wiring, professional development for educators, and charter membership in the SchoolNet state network. Prototype schools will implement various configurations of hardware and software. These efforts will be studied to develop an understanding of the professional development,

policies, and resources necessary to support these technologically enhanced learning environments. Proposals that include schools from low-income districts will be given priority. For more information, contact: ***Ohio SchoolNet, 2151 Carmack Road, Columbus, OH 43221-3595, (614) 728-8324, FAX: (614) 466-0022.***

Wisconsin

One of the provisions of the 1995 Wisconsin Act 27 establishes an Educational Technology Board (ETB) which would consist of a nine-member board attached to the state Department of Administration (DOA). The board would include an employee of the division of libraries and community learning at DPI, appointed by the governor; an employee of DOA, appointed by the secretary of DOA; a member of the Wisconsin advanced telecommunications foundation (or a designee); an employee of the Public Service Commissions (PSC), appointed by the governor; a school board member or employee appointed by the governor; a technical college district board member or employee appointed by the governor; and an employee of a UW system institution or center appointed by the governor. Appointed persons would have a recognized interest in and demonstrate knowledge of computer technologies, distance learning technologies, educational media and electronic resources, electronic information dissemination, or telecommunications technologies. Some initial appointee terms would expire after one, two, or three years, but terms would generally last for four years.

ETB would provide consulting services to assist school districts and library boards in planning, developing, and implementing distance education and educational technology projects, writing applications for grants and loans, and consult and coordinate its activities with CESAs. Board activities are scheduled to begin in January 1996.

Distance Education

The 1995 Act authorizes Cooperative Educational Service Agencies (CESAs) to borrow from the trust fund on behalf of two or more districts belonging to the CESA for the purpose of conducting a distance education project by the school districts.

Information Technology Plans

Legislation specifies that all executive branch agencies, including DOA, must prepare and biennially revise a strategic information technology plan that identifies desired information technology resources and the priorities and justifications for the acquisitions based on the strategic business needs of the agency.

Purchase of computers by teachers

The 1995 Wisconsin Act requires DOA to negotiate with private vendors to facilitate the purchase of computers and other educational technology by elementary and secondary teachers for their personal use as a means of encouraging and assisting them in becoming knowledgeable about computers and other educational technology and their uses and potential uses in education.

Pioneering Partners grants

Grants for educational technology projects

The newly created ETB will administer a continuing appropriation for grants for educational technology or distance education projects that provide $10,000,000 in 1996-97. Funding will come in part from reallocation of a number of categorial grant programs administered by DPI. The rest would come from a reallocation of $4.7 million from the equalization aid appropriation.

Trust fund loans

A state trust fund loan program will make $15 million available annually (to the extent practicable) that will give priority to loans for educational technology or distance education projects.

Project criteria and eligibility for assistance

A school board, municipal or county library board, either individually or in conjunction with one or more other schools or municipal or county library boards, can apply to the ETB for a grant and/or loan for the purpose of implementing, expanding, or participating in an educational technology or distance education project. The ETB may approve an application for one or a combination of the following:

- A grant to directly fund all or part of the cost of an educational technology or distance education project
- A trust fund loan and a grant to subsidize the interest costs of the loan to pay for all or part of the cost of a project
- A nonsubsidized trust fund loan to pay all or part of the cost of a project

The ETB may also make a grant or loan for a project to: enhance the educational opportunities for elementary or secondary school students or other residents of the state, or both; improve the administrative efficiency of public schools; or enhance training and continuing education opportunities for public school teachers. Each application must include a needs assessment, detailed project description and evaluation method, and plan for continuing the project beyond the grant period. For more information, contact: ***Neah Lohr, Consulant, Microcomputer and Instructional Technology, State of Wisconsin, Department of Public Instruction, P.O. Box 7841, Madison, WI 53707-7841, (608) 266-3856.***

Other Technology Initiatives

Apple Classrooms of Tomorrow℠ (ACOT℠)
Cupertino, CA

Apple Classrooms of Tomorrow℠ (ACOT℠) is a research and development collaboration among public schools, universities, research agencies, and Apple Computer, Inc. ACOT's mission is to change the way people think about and use technology for learning. This includes investigating how teaching and learning change when people have immediate access to technology, and helping people better understand how technology can be an effective learning tool and a catalyst for change.

Since 1985, ACOT has studied instruction, assessment, teacher development, school design, the social aspects of education, and the use of new technologies in more than 100 elementary and secondary classrooms throughout the country. ACOT's goal is to create a teaching and learning program that can be replicated by teachers and students outside of the ACOT program.

In ACOT classrooms, technology is used for multimedia compositions, project simulations, modeling, information access, analysis, and collaboration. ACOT classrooms have immediate access to a wide array of MacIntosh technologies. In addition, ACOT demonstration sites enable teachers, researchers, and technology developers to create and implement a single experimental technology that is later transferred to other ACOT classrooms for widespread application and longitudinal study.

In 1992, the National Science Foundation granted $1.2 million to the ACOT project and three school districts to create national teacher development centers at the primary ACOT sites. These centers help non-ACOT teachers learn how to integrate technology into their classrooms.

Currently, ACOT continues to research the social implications of technology in the education environment. ACOT's research also emphasizes professional development—how to help teachers bring technology into schools in a meaningful way and offer them support as they adopt new instructional practices. ACOT aims to build a knowledgeable teacher work force that embraces change. For more information, contact: ***Apple Classrooms of Tomorrow℠ (ACOT℠), Apple Computer, Inc., Learning Technologies Group, 1 Infinite Loop, MS: 301-3E, Cupertino, CA 95104, (408) 974-5491, FAX: (408) 862-6430. To order ACOT research reports and videos: (800) 825-2145.***

CoVis: Learning Through Collaborative Visualization

Evanston, IL

The CoVis Project brings together thousands of students, more than a hundred teachers, and dozens of researchers and scientists working together to improve science education in middle and high schools. Project partners include the Learning Sciences at Northwestern University in Evanston, Illinois; the Department of Atmospheric Sciences at the University of Illinois at Champaign-Urbana; the Exploratorium in San Francisco; and Bellcore in New Jersey. The project uses advanced technologies to transform science learning to better resemble the authentic practice of science. Participating students study atmospheric and environmental sciences through inquiry-based activities using state-of-the-art equipment. Students have access to the same research tools and data sets used by leading-edge scientists in the field, including scientific visualization software specially modified for the learning environment. CoVis provides students with a range of collaboration and communication tools including: desktop video teleconferencing; shared software environments for remote, real time collaboration; access to resources of the Internet; a multimedia scientist's notebook; and scientific visualization software. In addition to deploying new technology, CoVis Project staff work closely with teachers at participating schools to develop new curricula and new pedagogical approaches that take advantage of project-enhanced science learning. For more information, contact: ***Learning Through Collaborative Visualization, Attn: Susan Rand, Rm. 245, School of Education & Social Policy, Northwestern University, 2115 N. Campus Drive, Evanston, IL 60208, (708) 467-2226, FAX: (708) 467-1930; Louis Gomez, Co-Principal Investigator, E-mail: gomez@ils.nwu.edu; Dean Roy D. Pea, Co-Principal Investigator, E-mail: pea@nwu.edu; Barry J. Fishman, E-mail: bfishman@ils.nwu.edu.***

Frank Paul Elementary School

Salinas, CA

In his class of 31 fifth-graders in Salinas, California, Cliff Gilkey uses technology to support authentic learning activities.

Frank Paul is located in an agricultural town in a community rift with poverty, crime, drugs, and gangs. The student population is 86 percent Latino, 7 percent African American, 4 percent Anglo, and 3 percent Asian American. Sixty-four percent of these students are classified as limited English proficient and thirty-three percent qualify for migrant education.

The school strives to produce students who are literate in both English and Spanish, provide a caring environment, and support collaborative learning and small-group work.

Word processing and cross-country telecommunication are just are few of the uses that Gilkey has found for technology. Since 1993, Gilkey and his students have been developing curriculum materials on local minority leaders. The class undertook the project after discovering that many of the curricular materials on Latino leaders was out of date or at too high a level for the students. The multimedia project focuses on local Latino leaders as well as African American and Vietnamese politicians, businesspeople, researchers, and educators. Students conduct and videotape interviews and compose written highlights from the interviews. Through the use of technology, students are able to produce materials of such a high quality that others might consider purchasing them. Selecting local, current leaders gives students a positive focus that is often missed in portrayals of communities. The students enjoyed inviting leaders into the classroom as well as visiting them at their worksites.

The local heroes project is an instance of technology that supports higher-level thinking skills. Throughout the project, students' critical thinking skills are activated. To prepare for interviews, students conduct library searches of interviews with famous people and analyze the interviews to develop their questions. Students learn interviewing techniques, plan and organize their activities, perform video recording and editing functions, and identify and solicit appropriate local leaders for participation.

Students work in teams of three—one student acts as interviewer, one as cameraperson, and the other as recorder. Following fieldwork, each team reviews and critiques its videotaped interviews. Students then discuss ways to improve their techniques and interview questions and document their activities.

Gilkey acts as a facilitator throughout this process—guiding students and challenging them to ask provocative questions and fine-tune their interview techniques by suggesting important points to consider. Gilkey found that he and the students learned together while exploring the media.

This project demonstrates the power of technology. Gilkey has found ways to enhance student learning given limited technologies such as a camcorder, video player, television, and computer (a Mac LC). For more information, contact: ***Clifford Gilkey, Frank Paul Elementary School, 1300 Rider Avenue, Salinas, CA 93906, Class: (408) 753-5766, Office: (408) 753-5740, FAX: (408) 753-5268.***

Global SchoolNet Foundation

Bonita, CA

Since 1985, Global SchoolNet Foundation (GSN) has been a leader in the instructional applications of telecommunications. Today the Global SchoolNet Foundation, a 501(c)(3) nonprofit corporation, is a major contributor to the philosophy, design, culture, and content of educational networking on the Internet and in the classroom.

GSN conducts some of the oldest and most popular ongoing learning projects on the Internet, including Newsday and Geogame, as well as a growing number of new projects, such as the Global SchoolHouse and Where on the Globe is Roger. GSN also provides a variety of services to help teachers conduct their own projects, including project registry services and HILITES, the only moderated project announcement listserve on the Internet. You can learn about most of GSN's services at their award winning World Wide Web home page at http://gsn.org. Or send for information via E-mail at info@gsn.org. For more information, contact: ***The Global SchoolNet Foundation, P.O. Box 243, Bonita, CA 91908, (619) 475-4852; Inernet: http://gsn.org; E-mail: info@gsn.org.***

Maat Imhotep Technical Academy

(formerly William Robinson Elementary School)

Detroit's Maat Imhotep Technical Academy is a schoolwide Chapter 1 school serving preschool to fifth grade students. The school is one of Detroit's choice schools with a special focus on computer technology and African-centered subjects.

Technology is an integral part of the learning process at Maat. Each classroom, at *all* grade levels, is equipped with an average of three IBM or IBM-compatible computers. All computers in the school are joined through a Local Area Network and the school library/multimedia center computer and modem provide access to resources external to the school.

The computers allow flexibility in classroom activities and enable students to work at their own pace. Computers support all areas of study—language arts, social studies, math, and science. Computer software also allows school staff and parents to follow student progress.

Computer applications are updated regularly and teachers receive ongoing professional development training.

A School Improvement Committee handles planning based on input and recommendations from teachers, students, and parents. For more information, contact: ***Mrs. Beverly Buchanan, Principal, MAAT Imhotep Technical Academy, 12700 Grover, Detroit, MI 48205, (313) 245-3557, FAX: (313) 245-3402.***

The Open Charter School

Los Angeles, CA

The Open Charter School was established in 1977. The school, located in Los Angeles, has a student population that is 39 percent Anglo, 21 percent African American, 20 percent Hispanic, 18 percent Asian American, and 3 percent of other ethnic backgrounds.

Technology is used to support learning that activates students' critical thinking skills. The city-building learning activity at Open Charter School demonstrates this curricular goal. The activity is conducted in a classroom of 64 children, eight to ten years in age.

The project engages students in planning a City of the Future for the land site surrounding the school. The task is complex. Students must make projections about the future population size and composition of Los Angeles so they can consider the types of problems and needs that might arise for the citizens. They then invent technologies, design structures, plan institutions, and allocate resources to meet those needs.

The interdisciplinary curriculum, based on one developed by Doreen Nelson, combines elements of social studies, language arts, science, and mathematics. Students learn social studies by designing structures and functions of their city government. Students take on specific roles (e.g., mayor or head of the public works commission) and act in those capacities for the classroom. Science topics are covered as students learn about their commission responsibilities and design buildings and city systems based on scientific principles and the needs of their citizens. Opportunities for using mathematics are abundant. For example, when students plan new buildings they must calculate the area of their space and design buildings that are scaled appropriately to fit that space.

Students work in neighborhood teams in which each student has his or her own parcel of land that is part of the land site. Each student builds a HyperCard stack that includes a representation of the parcel plot; city, state, country, and world maps; and designs of the buildings they wish to locate on the parcel.

Students are also divided into eight commissions, such as the environmental or building and safety commission. Each classroom and city commission handles regulations and classroom responsibilities related to their scope of work.

Throughout the project teachers act as facilitators who encourage students to solve real-life problems. Through the constant process of asking probing questions and providing materials and resources, teachers become resources for, rather than directors of, learning. Teachers enable students to apply their growing knowledge in a variety of areas as they seek to create a better world for the future. For more information, contact: ***Dr. Grace Arnold, Principal; Denise Cole or Dolores Patton, teachers; The Open Charter School, Los Angeles Unified School District, 5085 Airdrome Street, Los Angeles, CA 90035, (213) 937-6249, FAX: (213) 937-2884.***

Ralph Bunche Elementary School

Harlem, NY

The Ralph Bunche Elementary School serves third through sixth graders in Central Harlem's Community District Five. The majority of its more than 700 students are African American and Latino and live in a neighboring housing project. In 1987, a few teachers, along with researchers at Bank Street College of Education, began the Earth Lab project to design a local area network system to support collaborative science investigation among elementary and middle school students. Teachers found that students were more active learners.

In 1990, a group of teachers started the Computer Mini-School in Ralph Bunche. The more than 200 students in the mini-school volunteered to participate and represent a cross section of students, including some with learning disabilities. Paul Reese is the technology coordinator who heads the mini-school. Standardized math test scores have increased significantly and reading test scores have slightly improved.

Each student at the school has his or her own E-mail address. Students use a variety of technology applications including video conferencing and video production. The students have their own video program called KWN (Kid Witness News). Students also explore a variety of online resources and telecommunicate with their peers throughout the world.

Funding through grants from Apple, National Science Foundation, Telebit, and NYNEX supports the mini-school's Internet node, and much of its equipment and software. For more information, contact: ***Paul Reese, Computer & Technology Coordinator, CSD Five & Ralph Bunche School, 425 West 123rd Street, New York, NY 10027, (212) 865-4351, E-mail: preese@ralphbunche.rbs.edu; Internet: http://Mac94.ralphbunche.rbs.edu.***

Rio Grande High School

Albuquerque, NM

Rio Grande High School has the largest number of Chapter 1 students of any high school in Albuquerque. Up to 60 percent of students read below grade level and approximately two-thirds of freshmen fail to graduate. But computers and mathematics teacher Gayle Wilson is using image processing materials to improve students' communication, math, science, and technology skills. Since 1992, Wilson has been involved in the Image Processing for Teaching (IPT) project, which started in 1989 in the Lunar and Planetary Laboratory at the University of Arizona. Wilson uses this approach to teach students of differing ages and ability levels.

After going over key math and science concepts, Wilson supervises student activities. Students work on projects in pairs with different groups undertaking different projects. One advanced student in Wilson's class videotaped himself doing jumps while skateboarding and worked with his physics teacher to analyze the force involved in the jumps. Students engage in a variety of activities using the CD-ROM and other available technologies, including scanners, video cameras, the Internet, and digital still cameras. Students demonstrate a more positive approach to math and science, and students who have previously shown little interest in classroom activities are motivated to learn.

During the school year, Wilson uses the first semester to introduce students to image processing and familiarize them with the math and science concepts underlying it. During the second semester, students usually work in pairs to teach a class of their peers about image processing. Students are also responsible for creating and demonstrating an original project using image processing. Projects are graded by a committee of persons unfamiliar with the project that typically includes administrators, teachers, and students when possible. For more information, contact: ***Gayle Wilson, Rio Grande High School, 2300 Arenal Road SW, Albuquerque, NM 87105, (505) 873-0220, FAX: (505) 873-8523, E-mail:wilson@apsicc.aps.edu.***

Key Terms

Below you will find a few basic terms that you may need for your journey down the information superhighway. These terms have been adapted from Internet for Dummies *and the guidebook for NCREL's* Merging Onto the Information Highway *video, both of which are annotated in the Resources section of this booklet.*

access	The ability to send and receive information via modem.
account	Arrangement between the service provider and the user that gives the user a unique name and address on a computer network.
address	Location, as in "E-mail address."
Archie	Tool used to search the Internet; name refers to archive.
archive	Collection(s) of files; sometimes refers to a saved file or a group of files that have been compressed for efficient storage and require an archive program to get the original files back.
article	A posting to a newsgroup.
ASCII	Acronym for American Standard Code for Information Interchange, machine code for computer information.
AUP	Acceptable Use Policy, a set of rules describing the activities permitted on a network.
BBS	Acronym for Bulletin Board System.
bps	Bits per second; refers to data transfer speed. Usually refers to modem speed.
bulletin board system	Computerized system open to the public for reading and posting messages.
byte	A series of bits of a particular length, usually eight. Computer storage is usually measured in bytes.
chat	To "talk" with other users online.
client	A computer that uses the services of another computer (such as Archie or the World Wide Web). When you dial into another system from a Macintosh or PC, your computer becomes a client of the system you dial into.

connect	To go online via a modem.
CUSee Me	Cornell University-developed software that enables users to teleconference with one another.
dedicated line	Usually refers to a hard wire connection between two computers, i.e., LAN (Local Area Network).
dial-in	A connection, usually made via modem, between two computers (or servers) over standard voice-grade telephone lines.
discussion group	A network group that discusses a specific topic online.
download	The process of receiving entire files from another computer.
E-mail	Electronic mail system that lets people send and receive messages with their computers.
ethernet	A cabling system that connects pieces of the LAN (Local Area Network) in a particular pattern.
frame relay connection	A virtual connection between one network router and multiple predefined network routers.
freeware	Free software, often available online.
freenet	A free online system; many have sprung up throughout the country and you can telnet from one to another.
FAQ	Frequently Asked Questions, a regular feature of many newsgroups.
finger	A program that displays information about someone on the net and which might include log-on name, full name, and log-on time.
FTP	File Transfer Protocol, a program or tool used to retrieve and send files.
gateway	Computer that switches from one host to another.
gopher	Method for getting from one place to another on a network by browsing menus.
host	The computer where the main program or network resides.
hub	Hubs connect computer networks together.

HTML	Hypertext Markup Langugage, used in writing pages for the World Wide Web and other hypertext programs that includes codes that define fonts, layout, embedded graphics, and hypertext links.
hypertext	A system of writing and displaying text that enables the text to be linked in multiple ways, available at several levels of detail, and contain links to related documents. Hypermedia can also contain pictures, sounds, and video.
IP	Short for Internet Protocol, the standard protocol used by systems communicating across the Internet.
icon	A small picture depicting something greater, such as a program or choice of action or object.
(The) Internet	The international network of networks.
LAN	Local Area Network, which usually connects computers within one room or one building.
leased line	A telephone line that is leased from the telephone company that establishes a connection between two locations.
listserve	Online Special Interest Group for specific topics, accessed through E-mail.
log-in	The procedure used to sign on a user to a host computer.
Maven/audio	A program that allows you to send sound files over the Internet.
menu	Table of contents for a network.
modem	A device that allows a computer to send and receive data via a phone line.
Mosaic	A program that lets you access information on the World Wide Web.
navigate	To use a program to move through the Internet.
newsgroup	Discussion group where people leave messages for others to read.

network	The infrastructure of computers connected by modems, wires, and/or software that provides technical support and physical connections to users in specific geographic regions.
node	Individual user/device on a network.
PPP	Point to Point Protocol, used to establish TCP/IP connections using serial lines such as dial-up telephone lines.
post	To publish a message on a network so that many users can read it.
prompt	The place where you enter commands.
protocol	Rules used for data transmission on computers.
real time	Simultaneous communication between people and computers.
remote access	Connecting an outside computer to a network using a modem.
router	Equipment that switches information from one network to another.
server	The host computer or computer where all programs are stored. Servers provide services such as Archie or the World Wide Web.
shareware	Low-cost software where the fee is paid directly to the programmer.
telnet	Connecting to a remote computer through a network.
terminal dial-up access	Using a central computer host for connection to the Internet as well as for storage space and processing power.
upload	Transferring files from your computer to another computer.
user	The person on the computer.
Veronica	Very Easy Rodent-Oriented Netwide Index to Computerized Activities, a gopher search tool.
WAIS	Wide Area Information Server, a tool for searching the Internet libraries.
WAN	Wide Area Network, a network over a large area.
WWW	World Wide Web, a hypertext system where users can search through linked documents in any path they choose.

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